

tions thirty-three signals, the verifications of which it was impracticable to determine.

In fifty-nine instances winds were reported which would have justified the display of cautionary signals, but for which no signals were ordered.

No cold-wave signals were ordered during the month.

#### LOCAL VERIFICATIONS.

The following is from the report of the "Michigan State Weather Service" for August, 1887:

There are now one hundred and forty stations in Michigan where weather signals are displayed, and seven railroads on which weather signals are carried, there being twenty-five trains leaving terminal points in the morning which carry weather signals.

The percentage of verification of weather signals for August is as follows: (the verification is taken from reports of displaymen furnished this office monthly) temperature, 84.9 per cent.; weather, 82.1 per cent.; temperature and weather, 83.4 per cent.

The percentage of verification of weather predictions for August on the D., G. H., and M. R'y., is 83.3 for weather and 85.2 for temperature; on the C. & G. T. R'y., weather, 86.0, and temperature, 85.7; P. H. & N. R'y., weather, 84.1, and temperature, 85.3.

The following is from the August, 1887, report of the "Minnesota Weather Service:—"

Verifications of weather signals for Minnesota were 75 per cent. for weather and 74 per cent. for temperature.

The following is from the August, 1887, report of the "North Carolina Weather Service:—"

The percentage of verifications as determined from seven points in the state is as follows: weather, 76.0 per cent.; temperature, 75.9 per cent.

The following is from the August, 1887, report of the "South Carolina Weather Service:—"

The percentage of verification of the weather and temperature predictions for the whole state was: for weather, 81.5 per cent.; for temperature, 82.5 per cent.

The following is from the "Tennessee State Board of Health Bulletin" for August, 1887:

The percentage of verification of weather and temperature predictions, furnished daily from the Signal Office at Washington to the various stations in the state during the month, was for the state: weather, 91.4 per cent.; and temperature, 95.5 per cent.

#### ERRATUM.

In the tornado table on page 167 of the June REVIEW, the date of the tornado at Lead Hill, Ark., given as June 4th, should read May 4th.

### STATE WEATHER SERVICES.

The following extracts are republished from reports for August, 1887, of the directors of the various state weather services:

The "Arkansas Weather Service," W. U. Simons, Signal Corps, director:

The first half of the month was very warm, and high temperatures were reported generally. Of these the highest were 110° at Lead Hill on the 11th and 104° at Heber on the 14th. In most other parts of the state the highest temperatures occurred on the 2d to the 5th, and averaged 100° to 104°. The observer at Lead Hill reports the first part of the month hotter than during any previous August in the last six years. The first twenty days of the month covered the heated term. A cool wave passed over the state from the 21st to the 27th, and caused a fall of temperature of from 8° to 20°, and showers of rain in most cases. The average for the month was 79° 4.

The rainfall was very partially distributed, and while the phenomenal amount of 8.28 inches fell in Marion county, which is 3.48 inches above the August average there for the past five years, there were some sections in which none whatever fell. The most general rains fell in the northwestern part of the state, and the least in the southern and southeastern portions. The average for the state was 2.58 inches.

The heaviest rainfalls were 2.15 inches, at Eureka Springs; 2.00 inches, at DeVall's Bluff; 1.94 inches, at Altus; 1.65 inches, at Palarm; 1.80 inches, at Osceola; 1.62 inches, at Lead Hill; 1.50 inches, at Russellville and Dallas. Thunder-storms, with rain, were reported from Eureka Springs, Washington, and Lead Hill the 1st, and lightning and thunder on several other dates from a number of places.

Hail fell at Lead Hill during the storm of the 1st, and again on the 14th, doing considerable damage.

Meteors were observed at Lead Hill on the 9th, 10th, and 11th, and at Eureka Springs and Little Rock on the 10th and 11th, in large numbers and of considerable brightness.

The "Monthly Review of the Illinois Weather Service," Col. Charles F. Mills, director:

The month of August, 1887, was warmer than usual, the mean temperature, 75°, being 1° 5 above the normal for the month. The first half of the month was very hot, the mean temperature of that period, 80°, being over a degree higher than the normal for the same dates in the past thirteen years. The period from 16th to 22d had a normal temperature of about 74°. On the 23d a cool wave swept over the state, resulting in a fall of 13° in the daily mean temperature on the 24th, and minimum temperatures of 40° to 50° in the northern and central divisions of the state. The highest temperatures were reported from 1st to 4th and 9th to 11th, these dates covering the extreme heated periods during the month.

There was an average percentage of sunshine during the month, as compared with the August normal of the past six years, ranging from 55 per cent. in the northern division to 70 per cent. in the southern division.

Heavy rains (3.50 to 6 inches) fell in the extreme northern counties of the state, moderately heavy (2 to 3.50 inches) in the north-central section, and light in the remainder of the state, except in a few counties that received heavy local showers; the average rainfall for the state was 2.50 inches, the northern division receiving an average of 3.50 inches, the central 2.50, and the southern less than 1.50 inches. The heaviest daily rainfalls (about 3 inches) were reported from Stephenson, Putnam, and Henry counties on the 10-11th.

Frost was reported as having occurred on the bottom lands in the north-

central section of the state, and six counties in that section reported minimum temperatures of from 40° to 44°.

A violent local storm occurred in Shelby county on August 4th that destroyed everything in its path, twisting off trees fifteen inches in diameter, and moving a large church thirty feet from its foundations. The path of this tornado was from twenty to one hundred yards in width, the accompanying cloud being black and funnel-shaped.

The "Indiana Weather Service," Prof. H. A. Huston, of Purdue University, Lafayette, director:

The pressure for August was slightly below the normal, with only slight fluctuations, and small range. The greatest recorded was at Spiceland, where the barometer read 30.310 on the 31st, and the least at Indianapolis on the 17th, the barometer reading 29.760, the readings in both cases being reduced to sea-level. The greatest range at any station was 0.610, at Vevay.

The temperature was about 2° above the normal. At a great majority of stations the thermometer reached or passed 100° as a maximum. The highest point reached was 104°, at Brookville and Butlerville, on the 4th and 5th, and the lowest, 40°, at Mauzy, on the 29th.

The precipitation was nearly two inches below the normal, which adds to the already large deficiency this year, and increases the damage to standing crops, pastures, etc., and largely diminishes the water supply in many localities. Nor is this deficiency confined to this state and its neighborhood, but prevails over the greater portion of the country—in the south Atlantic states, the Gulf states, the Ohio and Tennessee valleys, the Lake region, and the upper Mississippi valley. It does not follow, however, that the great deficiencies reported in many localities necessarily cause extensive injury to the agricultural interests of the people living there. There is always considerable fluctuation in the rainfall of any section from year to year, and agricultural welfare depends more upon the equitable distribution than in the aggregate amount thereof. A county may, any year, have the average amount of rainfall, and have all usual crops a failure, owing to its irregular distribution. On the other hand the annual amount may fall many inches below the average without any serious damage, if the amount that falls be distributed to the best advantage. In some portions of the western slope the annual rainfall is usually amply sufficient to produce excellent crops, if it fell in proper season; but as it nearly all falls in the winter months, and little or none during the spring and summer, the result is that agricultural operations can not be carried on with any surety of success.

Through Indiana the August rainfall was very irregular, some places getting heavy rains, while places close by got very little. The southern counties got least and the central most. The greatest amount reported was 6.83 inches, at Fortville, and the least, 0.05, at Saint Meinrad's Abbey, and 0.25 at Princeton. Several heavy rains have been reported, running from one to two inches and over. The heaviest was at Fortville on the 17th, 2.21 inches, while at Princeton the observer reports that only 1.50 has fallen in three months.

Auroras were reported at Vevay on the 9th and 23d. Solar halos were reported at Vevay on the 12th and 16th, and at Rockville on the 16th; lunar halos at Vevay on the 11th and 13th, and at Butlerville on the 3d and 6th.

Brilliant meteors were observed at Vevay on the 4th, 7th, 9th, 10th, and 20th.

No frost has been reported during the month, but heavy dews have been reported from various stations.

### The "Iowa Weather Service," Dr. Gustavus Hinrichs, Iowa City, director:

August, 1887, averaged normal in temperature, was rather cloudy and with sufficient rainfall except in central Iowa, southerly winds and calms prevailing.

The mean temperature of the air was exactly equal to the twenty years' normal, 71° 2. It was almost the same in 1882, 1871, 1870, 1857, and 1853. But the temperature was very unequally distributed; for the first decade was very hot, being five degrees above normal, and the last decade was quite cool, being five degrees below the normal, while the middle decade of the month was normal in temperature. The notable hot spells fell on the 3d and 4th and 8th to 11th, and were about nine degrees above normal. The cold spell from the 23d to the 28th, being over ten degrees below normal, was more seriously felt by all. The fears of damaging frosts were groundless. Very light hoar frost did form on the morning of the 23d and 24th in northern Iowa (Osceola to Mitchell counties), and extended southward as far as Anama, Iowa Co., on the 24th, but it was so light as to do no harm whatever.

In cloudiness the month averaged 80 per cent. above normal; the first decade, only, was bright and hot.

Rain was very frequent in Iowa, on seven days only no rain fell; many of these rains were local and light. More general and abundant rains fell on the 3d, 5th, 10th, 13th, 16-17th, 20th-21st, and 25-26th. Thus from the 3d rains became more extended and pastures turned green again in all but central Iowa. The most extended and copious rains fell on the 10th, 13th, and 20th-21st.

The total rainfall at the central station was 72 per cent. of normal. For the state, it averages nearly three inches, if we except the central and middle-southern portion, from Boone to Linn and down to Wayne county, where the rainfall averages only about half as much. The Missouri slope received the highest, five inches in Adams and Harrison, and over seven inches in Monona county, the highest reported. Along the Mississippi the rainfall is between two and three inches, below Clinton, and increases northward, amounting to five inches at McGregor. In northern Iowa the rainfall generally lies between two and three inches.

For the whole state of Iowa the rainfall has been entirely satisfactory during the month, both in frequency and amount. The increased cloudiness of the last half of the month has greatly enhanced the useful effect of this rainfall. The pastures and meadows of Iowa are again bright green and growing, but wells and brooks are still very low.

Thunder-storms were nearly as numerous as rain storms during the first half of the month, but rare during the last—cold decade. Much damage was done to property and cattle by lightning, and several persons were killed.

High locally-destructive winds accompanied the thunder-storms of the 10th and 13th. Hail is reported only on the 3d in Hancock, and very light on the 8th in Osceola county. Fog was most extended on the 14th and 27th in middle and northeastern Iowa.

No northern lights are reported; solar halos were seen on six days, lunar halos on three days.

The corn crop of Iowa is mature and beyond the reach of harm from frost. The cloudy weather of the last decade protected the corn from serious frosts which continued clear weather would have threatened.

### The "Kansas Weather Service," Prof. J. T. Lovewell, Topeka, director:

This month has been characterized by two meteorological periods—one hot and dry, from the 1st to the 14th, during which the temperature ranged near 100°; the second period, extending thence to the end of the month, was the reverse, being cool and damp, and is the period that has saved to Kansas her fall pasturage and winter hay. It was during the second period that not only was the larger part of the rain received, but the rain came down in such gentle, soaking showers that not a drop was lost.

The mean temperature has ranged from 1° to 3° above the normal; the lowest temperatures occurred on the 24th and 25th, and are the lowest since the latter part of May, and the lowest for any August on record at Topeka.

The rainfall has been the encouraging meteorological feature. Except in the southwestern part of the state, where it has been slightly deficient, there has been a decided excess not only of rain, but of moisture in the way of damp air over the state, being the heaviest August rainfall on record at Topeka, and since the establishment of the signal service station at Leavenworth; while at Lawrence but four Augusts have exceeded it for nineteen years.

The close of the month finds all cereal crops made, so as not to be further affected by the weather, save some late planting of corn in the western and northern part of the state, and the usual fall crops, for which all reports show the ground to be in the best possible condition.

### The "Michigan Crop Report" (the state weather service is in charge of N. B. Conger, Sergeant, Signal Corps, at Lansing):

The meteorological features of the state are based upon the reports received from forty-six voluntary observers and seven of the United States Signal Service. Several valuable reports were not received this month in time to be used in this report.

The temperature has been about normal. There still exists a deficiency of rainfall, which, however, has been largely reduced this month. No storms of any magnitude have been reported. Light frosts were general during the latter part of the month, but no material damage has been reported.

**Atmospheric pressure.**—The mean monthly barometer, reduced to sea-level, for August, is 30.00 inches. The maximum pressure occurred on the 30th and 31st, and the minimum on the 17th, over the Upper Peninsula, and on the

22d over the Lower Peninsula. The low area of the 22d was accompanied by general rains, which were heavy in some parts of the state; frosts occurred on the 24th (after the passage of the low area referred to), and were general throughout the northern part of the state.

**Temperature.**—The temperature for the month has been very near normal, the mean temperature being 0° 8 above the normal. The mean temperature for the Upper Peninsula, 62° 1, is 1° 2 below the normal, while for the Southern Peninsula the mean temperature for the northern section, 68° 7, is 0° 7 below the normal, central section the mean temperature, 67° 4, is 0° 9 above the normal, and the southern section is also 0° 9 above.

The highest mean daily temperature, 78° 1, occurred on the 4th, and the lowest mean daily temperature for the state, 58° 1, occurred on the 26th.

The monthly range of temperature, 81° 5, is high for this month, and a very low temperature of 21° 5, is reported at Gaylord. This record is from tested instruments, yet this seems to be an exceedingly low temperature for the month of August for the latitude.

Light frosts on the low lands were general throughout the north and central portions of the state on the 24th, 25th, and 26th, but no material damage was reported.

**Precipitation (in inches).**—The drought continued in all portions of the central and southern sections of the state until the 10th, when general rains fell throughout the state; rain occurred on the 11th, 13th, 14th, 15th, 17th, and 18th in southern and central Michigan, and the heaviest rains occurred on the 23d. Big Rapids records 2.64 on the 22d, and Alma, Gratiot Co., reports 2.84 of rain falling in forty-five minutes on the 22d. The average rainfall for August is still below the normal, there being a deficiency of 1.25. Corunna, Shiawassee Co., reports the rainfall to be inappreciable for the month, and the next lowest record is at Gaylord, Otsego Co., where but .09 is recorded. The deficiency for the southern section is 0.92; central section, 0.99; northern section, 2.01 inches, and the Upper Peninsula, 1.68.

The greatest deficiency occurred this month in the northern section, while for July the greatest deficiency occurred in the southern section.

**Winds.**—The prevailing wind for the month has been northwest. No heavy wind storms have occurred. The maximum velocity reported is thirty-seven miles, west. The average monthly movement is 4,773 miles, this being considerably under the average number of miles of wind recorded for this state.

#### Summary.

Mean monthly temperature, 66° 5; mean of maximum temperature, 94° 6; mean of minimum temperature, 40° 7; mean monthly range of temperature, 58° 9; highest temperature, 108°, at Three Oaks, on the 3d; lowest temperature, 21° 5, at Gaylord, on the 25th; monthly range of temperature, 81° 5.

Mean monthly rainfall, 1.95 inches.

Prevailing direction of wind, northwest; average monthly movement of wind, 4,773 miles; maximum velocity of wind and direction, 37 miles west, on the 9th, at Mackinaw City.

Average number of clear days, 13.2; average number of fair days, 11.2; average number of cloudy days, 6.6; average number of days on which .01 inch of rain fell, 6.4.

**Auroras.**—Alma, 24th; Saint Ignace, 24th, 28th; Kalamazoo, 27th; Calumet, 28th, 29th.

**Meteors.**—Kalamazoo, 5th, 8th, 11th, 13th, 19th; Calumet, 9th, 11th, 27th; Hanover, 11th; Petersburg, 27th.

### The "Minnesota Weather Service," Prof. Wm. W. Payne, Carleton College, Northfield, director:

The month was characterized by a temperature below normal, and a deficiency of precipitation except over a small area in the southeastern portion of the state. From the 1st to the 14th there was an excess of precipitation and temperature; for the week ending the 20th the temperature and precipitation were deficient; from the 21st to the close of the month the temperature was below the average and rainfall slightly deficient. The first frosts of the season, which occurred generally over the state on the mornings of the 24th and 25th, did no serious injury to grain, but tender vegetables were in many instances nipped. Toward the close of the month the rainy weather retarded threshing in the southern portion of the state, but improved the pastures, although too late to materially benefit corn.

**Temperature.**—During the early portion of the month it was slightly above normal, while toward the close it fell considerably below. The mean for the state is 65° 3, this is 2° 2 above that for the corresponding month of 1886, and 4° 7 below that of 1886. At stations taking observations for a number of years the mean is about 3° below the average. The mean of the maximum temperatures is respectively 6° above and 5° below that of 1886 and 1886; the minimum temperatures are about the average. The warmer periods of the month were the 1st to the 12th (inclusive), 16th, 17th, 21st, 28th to 31st; the highest temperatures for the month occurred during the first of these periods. The maximum was 101° and registered at Spring Valley on the 10th; this is 8° below that for 1886; the next highest was 96° and registered on the 2d at Sherburne, La Crosse, and Grand Meadow. In August, 1886, the maximum at Saint Vincent and Grand Forks was 108°, while for this month it was only 88° and 86°, respectively. The cooler terms were the 18th and 22d to 28th; on these days the mean daily temperatures were generally below 60°, while the minimum temperatures were below 40°. Some of the lowest reported were: Tracy, 22°, 25th; Saint Vincent, 29°, 25th; Pokegama Falls Dam and Park Rapids, 30°, 25th; Morris, 33°, 24th; Spring Valley, 84°, 25th. The greatest monthly ranges of temperature were generally in the southern counties, Spring Valley and Tracy reporting the maximum ranges, 67° and 69°,

respectively. The north-central counties report the least ranges, that at Lake Winnibigoshish Dam being 37°, and Brainerd, 42°. The monthly range of temperature for the state is 79°; this is 6° more than that for the same month last year.

**Precipitation (in inches).**—The average for the state is 3.04; this is about half an inch above that of the corresponding month of 1885 and 1886. Rain was frequent and quiet general, although many local showers occurred throughout the state, causing the stations in Goodhue and Olmstead, and the counties northwestward to Wright and Meeker, to report an excess of precipitation, while other stations generally reported a deficiency. The least amounts, which were generally below two inches, were reported from the northern portion of the state. Brainerd recorded a fall of only 0.87, while Park Rapids and Grand Forks reported 1.25. At Duluth the deficiency is 1.71; La Crosse, 1.36; Moorhead, 1.23; Saint Vincent, 1.09; Saint Paul, 0.29. The heaviest monthly rainfalls were: Delano, 7.00; Red Wing, 6.70; Excelsior, 6.10; Litchfield, 5.18; Rochester, 5.09. Rain was of frequent occurrence throughout the state on the 2d, 3d, 7th to 10th, 12th to 14th, 19th, 21st, 22d, 26th, 28th, 30th, 31st. Stations reporting over an inch of precipitation, with amounts and dates, are: Pokegama Falls, 1.20, 22d; Pine River Dam, 1.20, 21st; Morris, 2.53, 10th, 2.08, 13th, and 1.79, 31st; Litchfield, 1.85, 9th, and 1.80, 13th; Delano, 1.50, 13th; Saint Paul, 1.08, 13th; Excelsior, 2.67, 14th, and 1.00, 31st; Red Wing, 1.51, 10th, and 2.78, 13th; Northfield, 1.19, 10th, and 2.20, 13th; Mankato, 1.60, 13th; Rochester, 1.50, 14th; Rolling Green, 1.20, 8th; Spring Valley, 1.50, 13th; Albert Lea, 1.96, 13th; Grand Meadow, 1.36, 13th; Princeton, 1.50, 22d. Owing to the great frequency of rain and the prevailing cloudiness the relative humidity was somewhat higher than usual. The mean for the state is 77 per cent.; this is higher than that for the same months of the two preceding years.

**Winds.**—The prevailing direction was from the southwest.

Lunar halos were observed at Rolling Green, 29th; Tracy, 6th; Brainerd, 6th and 30th; Park Rapids, 31st; Saint Vincent, 28th and 31st. Solar halos were observed at La Crosse, 8th and 12th.

Sleet fell at Glenwood, 30th and 31st. Hail was reported to have fallen at Red Wing, 2d; Sherburne, 8th; Rolling Green, 9th; Lake Winnibigoshish Dam, 1st, 12.30 a. m., and during night of 10th; Northfield, 31st.

The "Mississippi Weather Service," Prof. R. B. Fulton, of the University of Mississippi, Oxford, director:

#### Summary.

Mean temperature, 81°. The highest, 103°, and the lowest, 50°, occurred at Meridian. Absolute range of temperature, 53°. Greatest monthly rainfall, 7.88 inches at Edwards. Least monthly rainfall, 0.06 inch at Corinth. Average depth of rainfall, 2.69 inches. Average number of days on which rain fell, 5.5.

The rainfall for the first eight months of the year has been peculiar in several respects. The mean rainfall for the state during these months was 28 inches; about 15 inches less than the normal amount. Every month showed decidedly less than the normal except June, which showed a slight excess. The rains during these months were generally light, but tolerably well distributed as to time. The deficiency of rain during the past month has been unfavorable to the cotton crop; and it has been damaged considerably, principally in the bottom lands, by the army worm.

The rainfall was greatest in the southern and western portions of the state, and least in the northeastern portion.

The following heavy rainfalls (one inch or more) were reported: 1.10 inches at Hermanville on the 6th; 1.12 inches at Loch Leven on the 18th; 1.00 inch at Lake on the 10th; 1.21 inches at Greenville on the 6th; 1.00 inch at Jackson on the 18th; 1.58 inches at Vicksburg on the 5th; 1.95 inches at Edwards on the 18th.

Biloxi: meteors were noticed in great numbers on the evenings of the 10th and 11th.

Palo Alto: we had very light rains here on the 1st, 5th, 6th, 7th, and 8th; since then not a drop has fallen. A terrible drought is prevailing. Stock is suffering very much in some localities for water. Late corn is ruined; cotton badly injured. Sweet potatoes will be almost a complete failure. No turnips have been sowed up to this date, and the gardens are completely burned up.

The "Nebraska Weather Service," Prof. Goodwin D. Swezey, of Doane College, Crete, director:

August has been a month of extremes of temperature, but on the whole cool, and the rainfall, unusual for August, has left the ground in excellent condition for fall plowing and for the recovery of vegetation from the unprecedented continuance of dry weather.

**Precipitation.**—The area of the state receiving the greatest rainfall extends from the centre of the state, northeasterly and easterly, including most of the Elkhorn Valley, and extending down that river southeasterly to near its mouth; this area has received over five inches, or about two inches more than the normal for August. The greater part of the state has received from three to five inches, with a gradual falling off towards the southeast and the north, where two localities, viz., the middle region of the Niobrara Valley, and that stretching from Lincoln toward Weeping Water, and southeast towards Nebraska City, have received less than three inches; almost the entire state has received more than the normal August rainfall.

**Temperature.**—The month has had both the hottest and the coolest days of any August for ten years; the highest temperature registered was 101°.5, at Omaha, and the lowest, 38°, at Valentine; 100° was registered in August, 1881,

and 40° in August of last year. The mean temperature has been 70°.9, about three degrees below the normal; the number of days above 85° has been thirteen, which is about the usual number.

**Storms.**—The extremes of temperature have been accompanied by numerous storms; both the hail and thunder-storms have been unusually numerous although not severe. No great damage from them has been reported from any part of the state.

The "New England Meteorological Society," Prof. Wm. H. Niles, of the Institute of Technology, Boston, Massachusetts, president:

Reports for the month were received from one hundred and forty-three observers.

August has had an excess of rainy and cool weather. The excess of rain occurred chiefly in the central districts, and may be, in most part, ascribed to the storm of the 18th; the low temperature was general as a result of a good share of cloudy weather and of frequent northerly winds on clear days.

Mr. J. B. Hall makes the following comparison of the rainfall of August at Worcester with the same in other Augusts, whose rain was more than double its normal quantity: 1852, 11.38; 1853, 10.71; 1856, 13.14; 1867, 10.79; 1887, 10.29.

At Holden, near Worcester, the fall was 9.95. Half of these large totals fell on the 18th, when the amounts collected were 5.25 and 4.85 inches, respectively.

Hon. W. L. Foster reports that this was the coldest August at Concord, N. H., for nineteen years; and the rainfall of the three summer months was 20.08 inches, being 2.79 in excess of the greatest summer rainfall in the last thirty-two years.

The month has shown eleven rather well-marked weather-periods of different lengths, characterized by changes from fair to rainy weather in accordance with general changes of atmospheric pressure. The most distinct of these were the fine cool days, beginning on the 7th, 13th, and 27th, and the rains on the 18th and from the 22d to the 26th.

The "New Jersey Weather Service," Prof. George H. Cook, of the Agricultural College, New Brunswick, director:

The nights of the month just closed, like those of August, 1886, were, with few exceptions, cool and pleasant, and it is worthy of remark that there was a difference of only two hundredths of a degree between the mean temperature of the nights of the one and that of the nights of the other. In fact there was, in the final result, but a trifling difference between the temperature of the former and that of the latter, the mean of August, 1886, having been 73°.3, and that of the last month, 73°.1.

The precipitation for August, 3.23 inches, was considerably less than the average, 5.11 inches, for the past forty-four years. Rain fell on six days, more than one-half of it falling on the 22d, attended by the most terrific thunder and lightning.

The "North Carolina Weather Service," Dr. Herbert Battle, of Raleigh, director:

**Temperature.**—Mean for August, 1887, 75°.4; normal for August, 76°.5; departure from the normal, -1°.1; highest observed, 99°.8, occurred at Oxford, N. C., on the 12th; lowest observed, 46°.0, occurred at Marion, N. C., on the 31st; highest on record, 103°.0, occurred in 1881 at Cape Henry, Va.; lowest on record, 46°.0, occurred in 1887 at Marion, N. C.; monthly range of temperature, 53°.8; mean daily range of temperature, 15°.9; warmest day, 7°.7 above the normal; coldest day, 16°.2 below the normal.

**Precipitation (in inches).**—Average for August, 1887, 8.85; normal for August, 5.61; departure from the normal, +3.24; greatest local daily rainfall, 9.00, at Tarborough, N. C., on the 3d; greatest monthly rainfall, 22.73, at Tarborough, N. C.; least monthly rainfall, 3.13, at Chattanooga, Tenn.

**Winds.**—Prevailing direction for August, 1887, northeast; average direction for August, northeast; highest velocity, eighty-two miles southeast, on the 20th, at Hatteras, N. C.

**Weather.**—Average number of clear days, 10.4; average number of fair days, 13.6; average number of cloudy days, 7.0; average number of rainy days, 13.6.

**Droughts.**—Longest duration of: at Reidsville, N. C., 11th to 15th, 5 days; Weldon, N. C., 7th to 12th, 6 days; Oxford, N. C., 9th to 12th, 4 days; Monroe, N. C., 9th to 12th, 4 days; Waynesville, N. C., 4th to 13th, 10 days; Mount Pleasant, N. C., 9th to 12th, 4 days; Salisbury, N. C., 28th to 31st, 4 days; Marion, N. C., 28th to 31st, 4 days; Tarborough, N. C., 9th to 14th, 6 days; Lynchburg, Va., 3d to 11th, 9 days; Wilmington, N. C., 9th to 12th, 4 days; Charlotte, N. C., 9th to 12th, 4 days; Chattanooga, Tenn., 9th to 14th, 6 days; Knoxville, Tenn., 7th to 12th, 6 days; Southport, N. C., 9th to 15th, 7 days; Norfolk, Va., 8th to 12th, 5 days; Hatteras, N. C., 8th to 14th, 7 days; Raleigh, N. C., 9th to 13th, 5 days.

The "Ohio Meteorological Bureau," Prof. B. F. Thomas, of the Ohio State University, Columbus, president:

The month opened warm, with maximum temperatures ranging from 90° to over 100° from the 1st to the 5th. General rain occurred over the state on the 1st, and heavy local rains in the northern and southern portions on the 2d; general rain occurred again on the 4th, 5th, and 6th in advance of a slight cool wave that came in then and lasted until the 8th. This was followed by warmer, fair weather until the 12th, when another cool area (preceded by

heavy local rains in the northern and central portions on the 11th, and general rain on the 12th) came in and lasted until the 31st, being intensified and producing light frosts at various points in the northern portion of the state from the 25th to the 31st. The weather accompanying this cool condition was unsettled until the 22d, when it settled down into a long spell of clear skies and dryness that lasted late into the following month.

The month furnished also the greatest extremes in temperature of any August since the opening of the bureau, the highest recorded being 104°, on the 4th and 10th, at Pomeroy, and the lowest, 33°, on the 29th, at Paulding, giving a range of 71°, or 11° greater than any preceding August, and furnishing the extremes of high and low temperatures recorded since 1882.

The number of clear and fair days was less, while the cloudy days exceeded the average.

The total mean monthly rainfall for the state was 2.39 inches, being 0.74 inch less than the average for the five years past, the greatest mean rainfall being recorded in the northern, and the least in the southern portions, being nearly four inches greater in the former than in the latter section.

The barometric pressure remained remarkably even during the month, the highest reading recorded, 30.331 inches, being on the 31st, at Akron, and the lowest, 29.645 inches, on the 17th, at the Ohio State University. The mean pressure, 29.990 inches, departed only .017 inch from the normal for the five years.

The mean temperature for the state, 70°·9, was exactly the same as last August, but exceeded the mean for the five years by one degree. The mean for the northern section was 68°·9; for the middle, 70°·9, and for the southern, 73°·4.

The first frost of the season occurred on the 25th, and again on the 28th, 29th, and 30th, in the northern portion of the state.

Mean daily range of temperature, 25°·9; greatest daily range of temperature, 54°, on the 8th, at Paulding; least daily range of temperature, 5°, on the 17th, at New Bremen.

Average number of clear days, 12.9.

Average number of fair days, 11.6.

Average number of cloudy days, 6.5.

Average number of days on which rain fell, 8.3.

Greatest number of days on which rain fell, 13, at Cleveland; least number of days on which fell, 4, at Hanging Rock, New Comerstown, and Wooster; mean monthly rainfall, 2.39 inches; average daily rainfall, 0.076 inch.

Prevailing direction of wind, northeast.

**"Oregon Weather Service,"** report prepared by B. S. Pague, Private, Signal Corps:

The temperature was from 0°·5 to 2° below the normal. The range being small; generally cool nights and warm afternoons. It was highest in the north-eastern part of the state, and lowest in the mountain region of the south. From the 5th to the 11th was a warm period; the other days of the month being cool.

The rainfall was below the normal, except at Ashland and Linkville, where it was above the normal. A few sprinkles fell in the interior valleys and along the coast; in the eastern part of the state the rainfall was principally from a thunder storm which occurred on the 11th. The rainfall of the season to date is below the normal in all districts, except at Linkville.

**The "South Carolina Weather Service,"** Hon. A. P. Butler, Commissioner of Agriculture for South Carolina, director:

In the Piedmont section of the state and in the counties of Chesterfield and Marlborough the rainfall during the month of August was above the average, while in the lower counties it was less than the average. At Charleston the rainfall for the month was 4.12 inches, or 3.72 inches less than the average of the last sixteen years.

The mean temperature was slightly below the average.

#### Summary.

Mean temperature, 77°·8; highest temperature, 101°, at Chester, on the 13th; lowest temperature, 49°, at Spartanburg, on the 31st; range of temperature, 52°; monthly range of temperature, 39°·3; greatest daily range of temperature, 33°, at Jacksonborough, on the 14th; least daily range of temperature, 2°, at Chester and Winnsborough, on the 8th.

Mean depth of rainfall, 6.54 inches; greatest monthly rainfall, 13.70 inches, at Brewer Mines, Chesterfield Co.; least monthly rainfall, 1.27 inches, at Branchville, Orangeburg Co.; greatest daily rainfall, 4.30 inches, at Evergreen, Anderson Co., on the 8th; least daily rainfall, trace (amount inappreciable), at several stations, on the 16th; average number of rainy days, 11.4. The heaviest rains of the month occurred on the 7th, 8th, and 27th, those on the latter date being unusually heavy in the northern and northwestern counties of the state.

**Hail storms.**—Hail storms, causing some damage to crops, occurred on the 16th near Winnsborough, and on the 17th near Broad River, in the vicinity of Lyles Ford. On the 17th a severe hail storm passed down South Tiger River from Duncan's, about fifteen miles from Spartanburg. It started near Cohen's Mill, passed Gowensville, and ended near Walnut Grove, destroying all corn, cotton, peas, etc., in its path.

**Local storms.**—On the 18th a wind storm at and near Winnsborough unroofed a house and blew down timber.

**Optical phenomena.**—Solar halos were observed at Stateburg on the 1st and 30th. Lunar halos were observed at Stateburg on the 1st, 2d, and 3d; at Spartanburg on the 4th, and at Columbia on the 1st and 30th.

**Meteors.**—On the 10th, at Columbia, several meteors were observed, moving in different directions, east to west predominating. On the 11th several were observed between 9 and 10 p. m., their general direction of movement being from northwest to southeast. On the 9th, at Stateburg, at 9.30 p. m., a bright meteor was observed midway between the North Star and the zenith; it moved northeast and disappeared in Cassiopeia. On the 10th, at 9.05 p. m., moving south-southwest, from near the zenith to head of Scorpio; also at 12.30 a. m., moving in a northerly course. On the 11th, between 9 and 10 p. m., three bright meteors, two moving from southeast to southwest, and one from northeast to northwest. On the 12th, one in east-northeast, course north to south. On the 10th, at 11 p. m., at Brewer Mines, Chesterfield Co.

**Floods.**—The heavy rains which occurred at the close of July, together with those on the opening days of August, caused high water in several of the streams of the state, notably the Savannah, Santee, Wateree, Congaree, and Broad Rivers and their tributary creeks. These rivers were all out of their banks at various points and caused considerable damage to the contiguous farming lands, submerging, and in many instances totally destroying, the growing crops. Bottom-land farmers on the Savannah River were the heaviest sufferers, while the rice plantations on the Santee were also considerably damaged.

The following is an extract from the report of the "Meteorological Department of the State (Tennessee) Board of Health," prepared under direction of J. D. Plunkett, M. D., President of the State Board of Health, by H. C. Bate, Signal Corps, Assistant, Nashville:

The feature for August was the abnormally high temperature during the first and second decades; otherwise there was but little departure from the normal.

The mean temperature was 76°·7, the highest August mean during the past five years. The highest temperature was 108°, recorded on the 3d, at Austin, Wilson Co., and the next highest was 102°, recorded on the 3d, 12th, and 14th, at Milan, Gibson Co. A maximum of 101° was recorded at Riddleton, Smith Co., on the 15th; at Savannah, Hardin Co., on the 2d; and at Hohenwald, Lewis Co., on the 2d, 3d, and 5th. The lowest temperature was 48°, recorded on the 25th, 29th, and 31st. The monthly range of temperature was slightly in excess of the normal, as was also the mean daily range. During the last decade a period of low temperature prevailed.

The mean precipitation was 3.07 inches, which was about an inch less than the August mean of last year, and about that amount more than the August means of the two preceding years. Of this amount, the eastern division received an average of three and three-fourths inches, and the middle and western divisions about two and three-fourths inches. The rains were mostly light and local in character. Those of the 5th, 15th, 17th, and 26th, however, were general, the last-named being the heaviest fall during the month. The greatest monthly rainfall was 6.43 inches, at Rogersville, and the least was only 1.21 inches, at Memphis, the smallest August rainfall at that station since 1872, when only 0.54 of an inch was reported. The greatest local daily rainfall occurred at Milan, on the 19th, when 2.96 inches fell. This was strictly a local rain, as no other observer in the state reported rain on that day except at Knoxville, and that inappreciable. The observer at Milan reports 5.10 inches of rain at his station during three days—the 19th, 20th, and 21st. Several of the rains (that of the 26th excepted) were attended by the usual electrical disturbances. There were eight days on which no measurable rain fell.

Dews were reported on about fifteen days.

Meteors were observed as follows: Riddleton, 24th, very large and brilliant, appearing 60° above southeast horizon, course west, leaving bright path behind. Just before disappearing—at 45° west, 7.45 p. m.—it gave off particles like a rocket, motion slow; Nashville, 10th to 12th, numerous, mostly small ones appearing in north and northeast, general direction southwest, space 10° to 30°; Trenton, 6th, 8 p. m., southeast, course southwest 30°, disappeared 20° above southwest horizon.

#### Summary.

Range of temperature, 55°; mean monthly range of temperature, 40°·7; greatest monthly range of temperature, 53°, at Hohenwald; least monthly range of temperature, 34°, at Covington; mean daily range of temperature, 17°·6; greatest daily range of temperature, 38°, on the 25th, at Hohenwald; least daily range of temperature, 2°, on the 17th, at Careyville, and on the 26th, at Rogersville and Waynesborough; mean of maximum temperatures, 97°·2; mean of minimum temperatures, 56°·5.

Mean daily rainfall, 0.099 inch; greatest rainfall, 6.43 inches, at Rogersville; least rainfall, 1.21 inches, at Memphis; greatest local daily rainfall, 2.96 inches, on the 19th, at Milan; days of greatest rainfall, 5th, 15th, 17th, 26th; day of greatest rainfall, 26th; days without rainfall, 9th, 10th, 11th, 12th, 28th, 29th, 30th, 31st.

Average number of days on which rain fell, 7.

Average number of clear days, 15.7.

Average number of fair days, 11.

Average number of cloudy days, 4.3.

Warmest day, 3d; coldest days, 25th, 31st.

Prevailing direction of wind, northeast.